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Tsai

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(54) **GAS FILLING NOZZLE WITH SAFETY FUNCTION**

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(51) **Int. Cl.**

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F17C 7/00	(2006.01)
B65B 31/00	(2006.01)
F17C 5/06	(2006.01)
B65D 83/42	(2006.01)

(52) **U.S. Cl.**

CPC ***F17C 7/00*** (2013.01); ***B65B 31/003*** (2013.01); *B65D 83/425* (2013.01); *F17C 5/06* (2013.01)

(58) **Field of Classification Search**

CPC B65B 31/003; F17C 5/02; F17C 5/06; B65D 83/425; B65D 83/14

USPC 141/3, 20

See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

5,887,609 A * 3/1999 Garretson F16K 21/165 137/2

* cited by examiner

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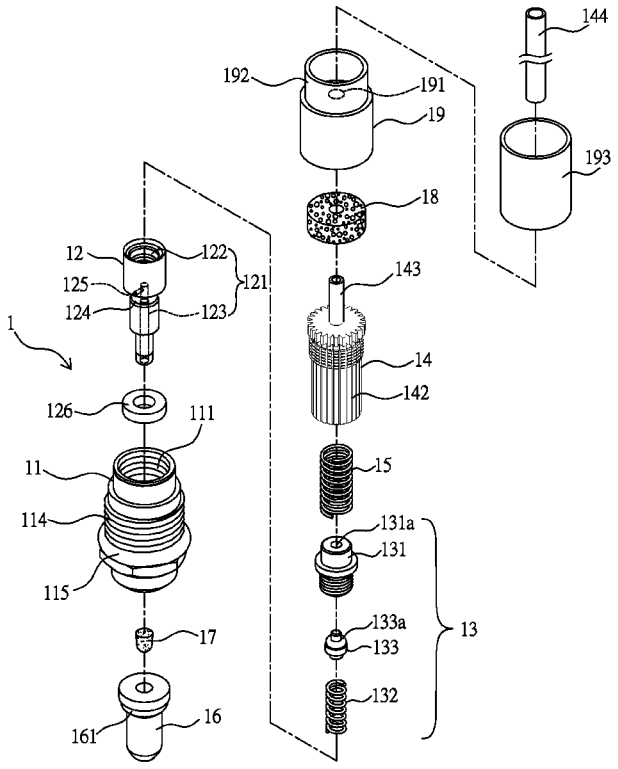
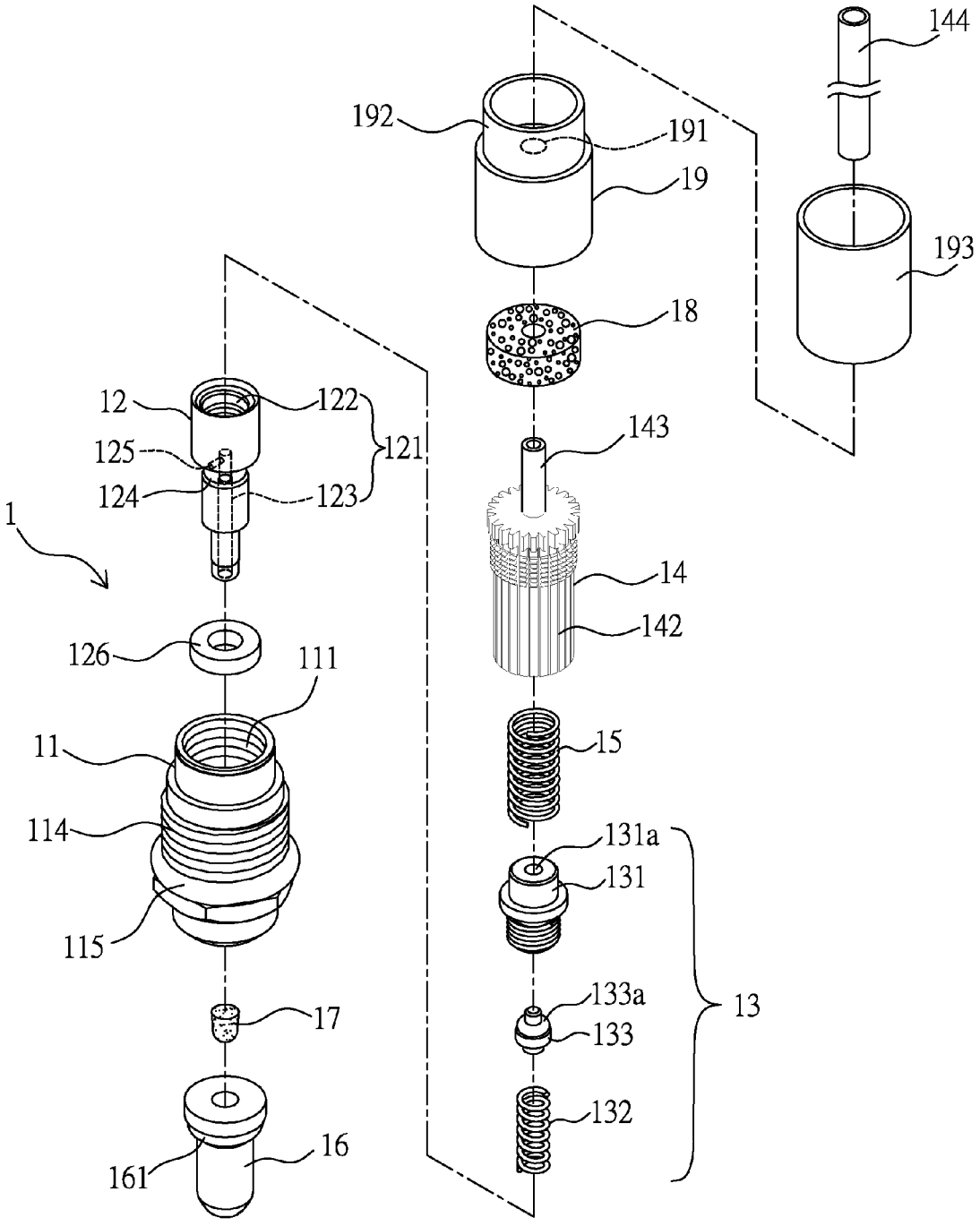
(57) **ABSTRACT**

A gas filling nozzle with safety function includes a valve seat, a first thimble, a safety valve, an inner sleeve and a first spring; the first thimble is sleeved in the valve seat, the safety valve is disposed at the top of the first thimble, and the inner sleeve is combined at the top of the valve seat, thereby allowing the first spring to be disposed between the inner sleeve and the safety valve. So when the gas filling nozzle is subject to a high temperature environment, the high-pressure gaseous/liquid mixture inside a gas container is able to be discharged to the exterior through the safety valve, thereby preventing the gas container from exploding.

8 Claims, 5 Drawing Sheets




144
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111
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131a
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131
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133a
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161

FIG. 1

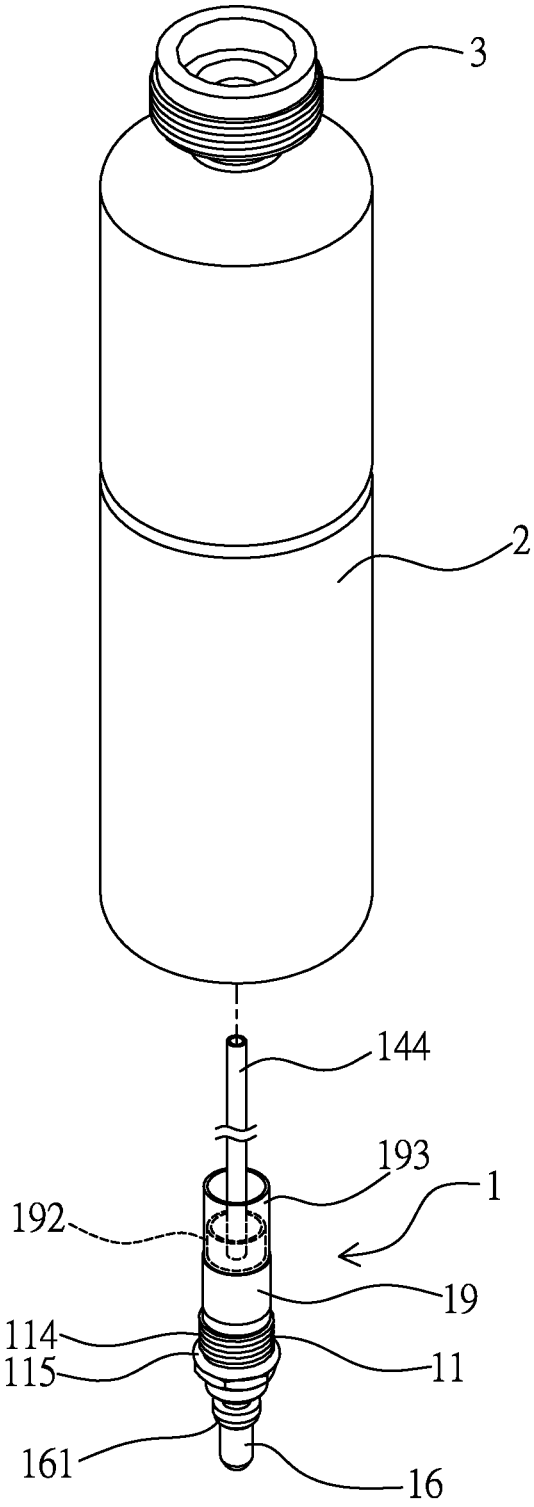

FIG. 2

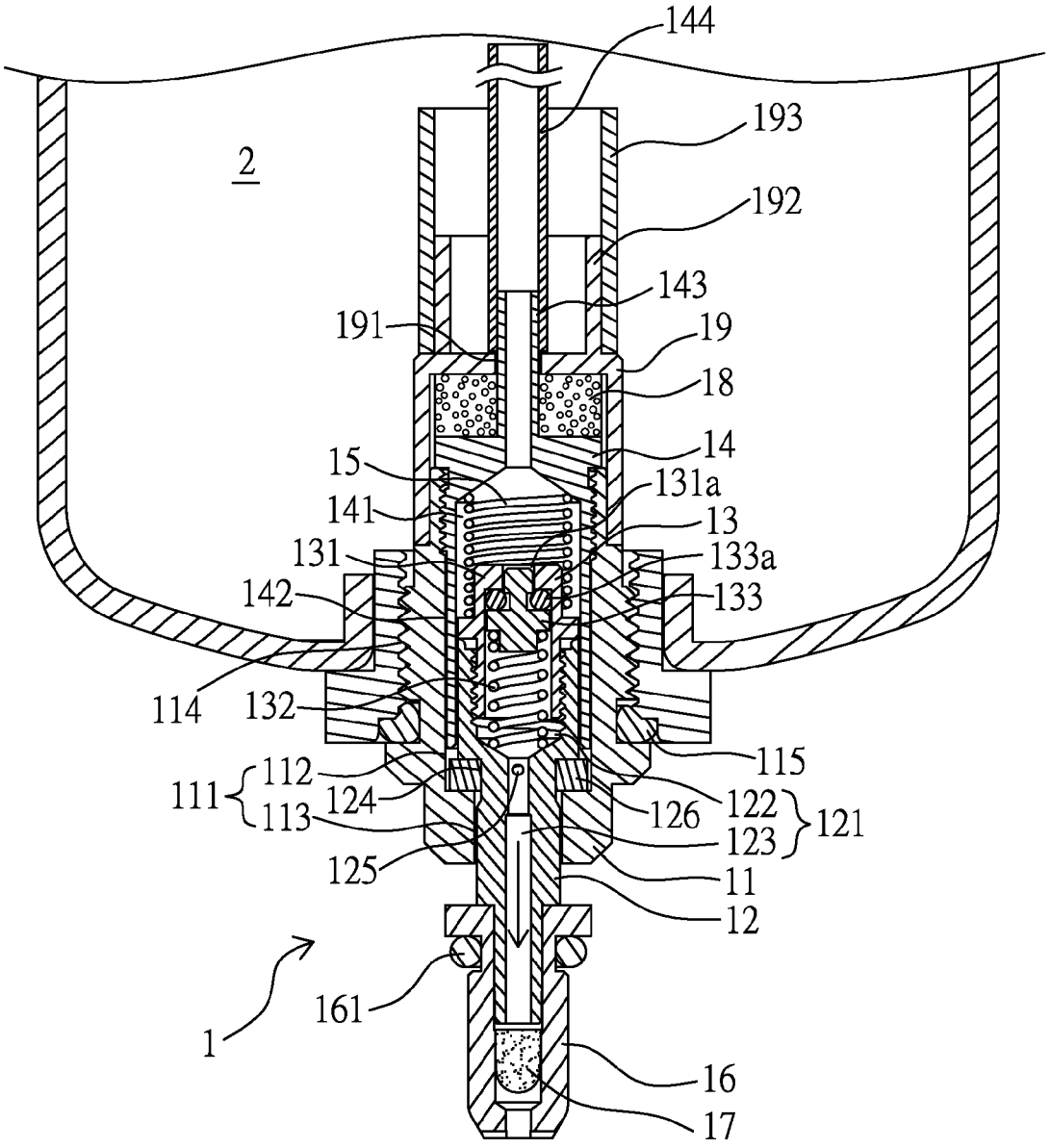
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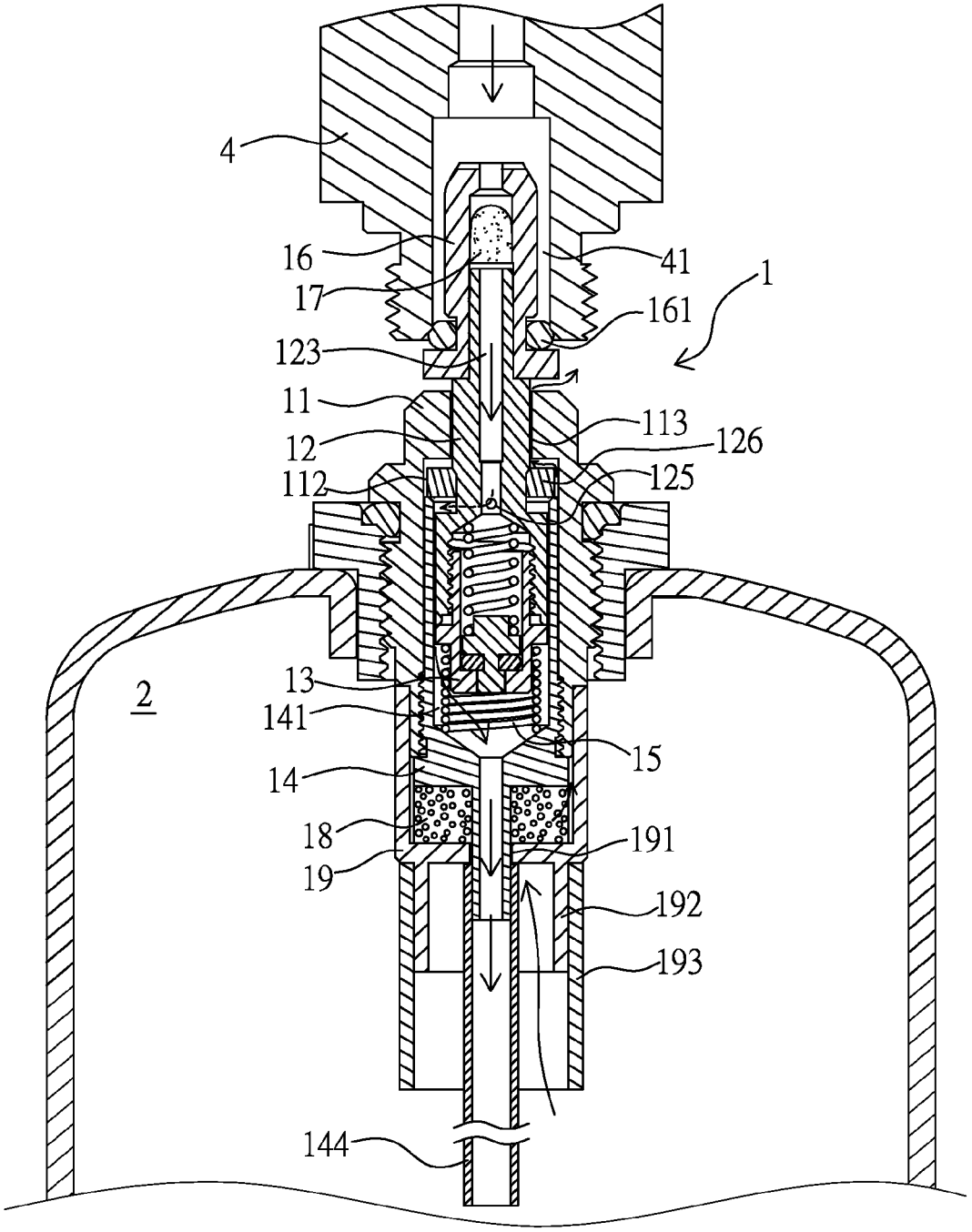
FIG. 3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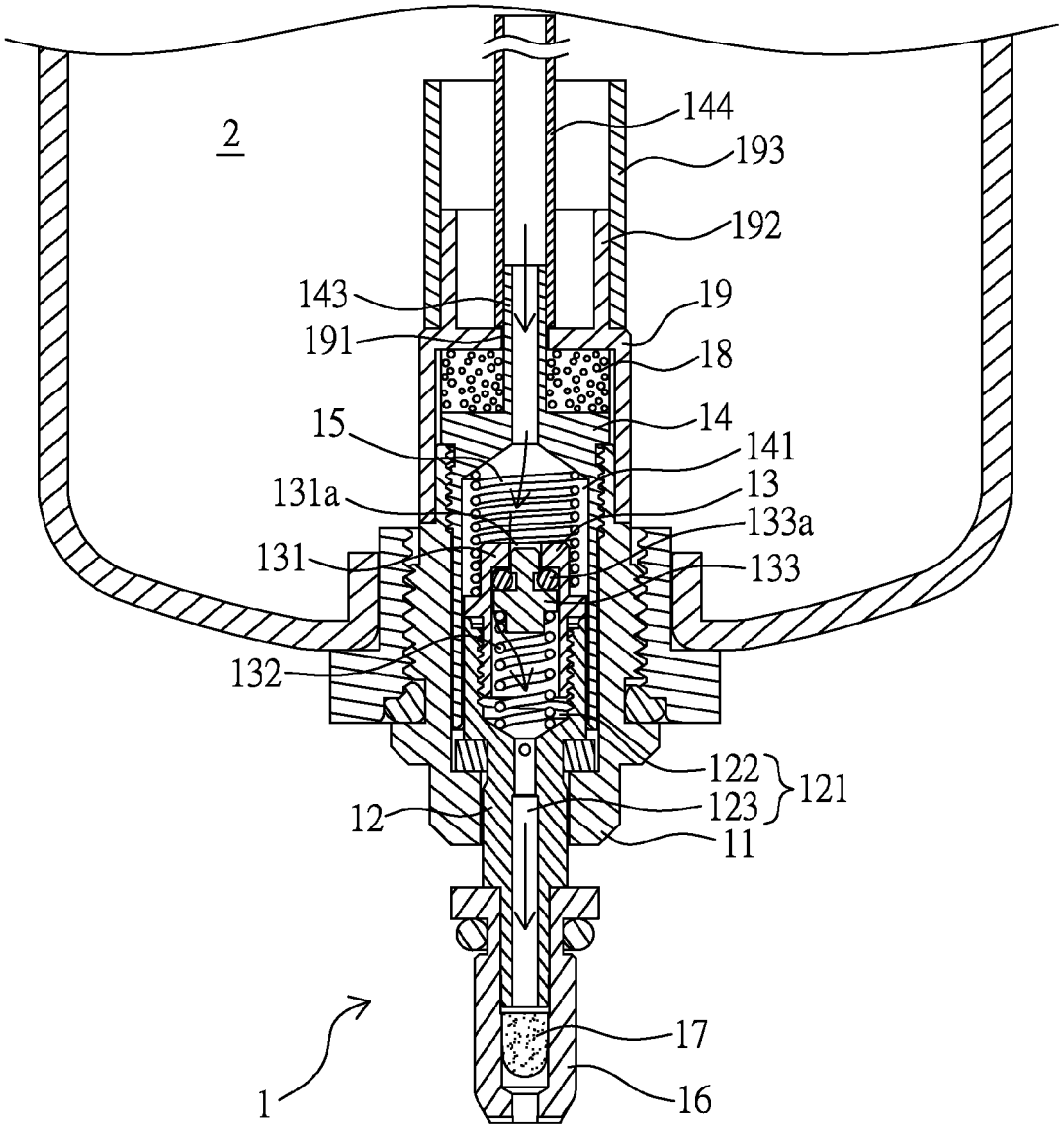
144

FIG. 4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16

FIG. 5

GAS FILLING NOZZLE WITH SAFETY FUNCTION

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a nozzle used in a gas container, especially to a gas filling nozzle with safety function, for example capable of preventing the gas container from exploding in a high temperature environment.

2. Description of Related Art

Fire is a must have element in our lives, with fire, we can cook food, can be provided with lighting, and the fire can also be used for combustion operations such as forging, soldering and welding. As such, the fuel, e.g. gas, is often formed in a gaseous status and the gas has to be stored in a high-pressure-sustainable metal container, for example a gas tank or a canned gas for ensuring the operation safety.

The top of a conventional gas tank is installed with a rotary control valve for allowing the gas to filled and stored or outputted, in other words the control valve is a bidirectional valve when being in an opened status; however, the volume of the gas tank is relatively large thereby not easy to be carried around.

The top of a conventional canned gas is also installed with a control valve which is set to be closed in a normal status, and the filling operation is to utilize high pressure to enable the liquid gas to pass the control valve and be filled in a can body, thereby allowing the canned gas to be provided with an advantage of easy to be carried around. However, the canned gas is not installed with a filling nozzle, when the liquid gas inside the canned gas ran out, the canned gas would be thrown away thereby causing unnecessary wastes. As such, the applicant of the present invention has developed a gas container, for example the Taiwan Patent Application NO. 103108440 has disclosed a gas container having a filling nozzle, so the gas container is capable of being repeatedly refilled and storing high-pressure liquid gas and allowing a user to easily hold and carry around.

A conventional combustion tool having a gas container is installed with a filling nozzle, so when the liquid gas inside the gas container ran out, additional liquid gas can be filled and stored in the gas container through the filling nozzle.

However, when the gas container is subject to a high temperature environment, e.g. being placed in an incinerator or in a vehicle exposed under sunlight, when the temperature inside the vehicle is getting higher, the vaporization of the liquid gas is facilitated, and the pressure inside the gas container would be rapidly increased, so the gas container is very likely to explode.

As such, the skilled people in the art would additionally install a safety valve at a proper location of the gas container, e.g. the top of the gas container, so when the pressure inside the gas container is greater than the preset pressure of the safety valve, the safety valve is able to be immediately opened for discharging the high-pressure gaseous/liquid mixture inside the gas container to the exterior, thereby preventing the gas container from exploding.

However, the safety valve has to be additionally installed on the gas container, so the assembly process would be complicated, and if the area of the gas container is overly small, the safety valve is unable to be installed thereon; as such, how to design a filling nozzle with safety function shall be seriously conserved by the skilled people in the art.

SUMMARY OF THE INVENTION

One primary objective of the present invention is to provide a gas filling nozzle with safety function, in which a safety valve is installed, so when a gas container installed with the gas filling nozzle is subject to a high temperature environment, the high-pressure gaseous/liquid mixture inside the gas container is able to be discharged to the exterior through the safety valve, thereby preventing the occurrence of explosion.

For achieving said objective, one technical solution provided by the present invention is to provide a gas filling nozzle with safety function, which includes: a valve seat, the interior thereof is axially formed with a stepped seat hole composed of a top seat hole and a bottom seat hole, and the exterior thereof is formed with a combination part; a first thimble, disposed in the seat hole, and the lower portion thereof is protruded out from the bottom seat hole, the interior of the first thimble is axially formed with a stepped thimble hole composed of a top thimble hole and a bottom thimble hole, a neck part defined at the outer periphery is radially formed with a neck hole communicated with the bottom thimble hole, and when the neck hole is not in a gas filling status, the neck hole is shielded by a sealing ring which is sleeved with the neck part; a safety valve, allowing a first spring and a second thimble to be disposed in the top thimble hole, and an end cover having the top being axially formed with a penetrate hole is combined with the top thimble hole, thereby allowing the second thimble to axially and elastically retract in the top thimble hole for sealing or opening the penetrated hole; and an inner sleeve, combined in the top seat hole, and the first spring is disposed between the end cover and a sleeve hole axially formed on the inner sleeve, thereby allowing the first thimble and the safety valve disposed at the top thereof to axially and elastically retract in the sleeve hole for enabling the sealing ring to seal or open the bottom seat hole, and the outer periphery of the inner sleeve is axially and annularly formed with a plurality of guide slots communicated with the top seat hole.

BRIEF DESCRIPTION OF THE DRAWINGS

The present invention will be apparent to those skilled in the art by reading the following detailed description of a preferred embodiment thereof, with reference to the attached drawings, in which:

FIG. **1** is a perspective exploded view illustrating the gas filling nozzle according to the present invention;

FIG. **2** is a perspective view illustrating the gas filling nozzle being installed with a gas container according to the present invention;

FIG. **3** is a cross sectional view illustrating the assembly of the gas filling nozzle and the gas container shown in FIG. **2**;

FIG. **4** is a cross sectional view illustrating the gas filling nozzle being in a liquid gas filling status according to the present invention; and

FIG. **5** is a cross sectional view illustrating the safety valve of the gas filling nozzle processing a pressure releasing operation according to the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring from FIG. **1** to FIG. **3**, the present invention provides a gas filling nozzle **1**, which includes a valve seat **11**, a first thimble **12**, a safety valve **13**, an inner sleeve **14** and a first spring **15**.

The interior of the valve seat **11** is axially formed with a stepped seat hole **111**, and the seat hole **111** includes a top seat hole **112** formed at the upper portion and having a

relatively larger inner diameter and a bottom seat hole **113** formed at the lower portion and having a relatively smaller inner diameter; the stepped first thimble **12** is disposed in the seat hole **111**, thereby allowing the lower portion of the first thimble **12** to be protruded out of the bottom seat hole **113**; the safety valve **13** is disposed at the top of the first thimble **12**; the inner sleeve **14** is combined, e.g. screw-fitted, in the top seat hole **112**; and the first spring **15** is disposed between the safety valve **13** and the top inner wall of a sleeve hole **141** formed on the inner sleeve **14**, thereby allowing the first thimble **12** and the safety valve **13** disposed at the top thereof to axially and elastically retract in the sleeve hole **141** of the inner sleeve **14**. Wherein, the outer periphery of the valve seat **11** is sleeved with a first anti-leaking ring **115**, so after the valve seat **11** is connected to a gas container **2**, an airtight effect is able to be provided through the first anti-leaking ring **115**.

The outer periphery of the inner sleeve **14** is axially and annularly formed with a plurality of guide slots **142**, thereby allowing the gas inside the gas container **2** to be discharged and allowing liquid gas to be filled in. In addition, the top surface of the inner sleeve **14** is axially extended with a discharge pipe **143** communicated with the sleeve hole **141**, and the discharge pipe **143** is further connected to an extension pipe **144**, thereby allowing the liquid gas to be filled in the gas container **2**.

Moreover, the interior of the first thimble **12** is formed with a stepped thimble hole **121**, and the thimble hole **121** includes a top thimble hole **122** formed at the upper portion and having a relatively larger inner diameter and a bottom thimble hole **123** formed at the middle and lower portion and having a relatively smaller inner diameter; a neck part **124** defined at the upper portion of the outer periphery is radially formed with a neck hole **125** communicated with the bottom thimble hole **123**, and when the neck hole **125** is not in a gas filling status, the neck hole **125** is shielded by an elastic sealing ring **126** which is sleeved with the neck part **124**, thereby preventing the liquid gas from passing the neck hole **125** so as to form a sealed status.

Furthermore, the bottom of the first thimble **12** is sleeved with a connection pipe **16**, and the outer periphery of the connection pipe **16** is sleeved with a third anti-leaking ring **161**, thereby forming an airtight effect during the gas filling status. Wherein, the interior of the connection pipe **16** is provided with a first filtering material **17** adjacent to the bottom of the first thimble **12** and used for filtering the impurities which are about to enter the gas filling nozzle **1**. The discharge pipe **143** is disposed adjacent to a second filtering material **18** which is used for filtering the impurities discharged from the gas container **2**. In addition, a top cover **19** is provided at the top of the valve seat **11** and used for covering the second filtering material **18** and the top of the inner sleeve **14**, and the discharge pipe **143** is protruded out from a cover hole **191** formed at the top of the top cover **19**. Wherein, in actual practice, the first and the second filtering material **17**, **18** are preferably to be a sintered member with micro pores formed through powder metallurgy or a sponge cushion. In addition, the outer periphery of the cover hole **191** of the top cover **19** is further extended with an engage ring **192**, and the engage ring **192** is sleeved with a position limiting pipe **193**.

The safety valve **13** includes an end cover **131**, a second spring **132** and a second thimble **133**. The top of the stepped end cover **131** is axially formed with a penetrated hole **131***a* thereby allowing the end cover **131** to be combined, e.g. screw-fitted, with the top thimble hole **122**; the second spring **132** is disposed in the top thimble hole **122**; and the cross-shaped second thimble **133** is sleeved at the top end of the second spring **132**, wherein the outer periphery of the second thimble **133** is sleeved with a second anti-leaking ring **133***a*, thereby allowing the upper portion of the second thimble **133** to penetrate into the penetrated hole **131***a*, and the second anti-leaking ring **133***a* is enabled to constantly seal the penetrated hole **131***a* so as to form an airtight status. The bottom end of the first spring **15** is sleeved with the end cover **131** and able to be moved through the axial movement of the first thimble **12** and the safety valve **13** for compressing the first spring **15**.

As shown in FIG. **2**, after the gas filling nozzle **1** is assembled as an individual member, a combination part **114**, e.g. formed as a thread part, of the gas filling nozzle **1** is screw-fitted with a screw-fitting part preformed on the bottom surface of the gas container **2**, and an airtight effect is able to be formed through the first anti-leaking ring **115**, wherein the status of the gas filling nozzle **1** being fastened with the gas container **2** is shown in FIG. **3**. The top of the gas container **2** is formed with a discharge part **3**, and the discharge part **3** can be further connected to a conventional combustion tool, e.g. but not limited to a heating torch; the top of the gas container **2** is able to be directly installed with a combustion tool, thereby allowing the gas container **2** to be served as a handgrip.

Referring to FIG. **1** and FIG. **3**, when the gas filling nozzle **1** is assembled as an individual member and installed at the bottom of the gas container **2**, the first spring **15** is in a stretched status, and the sealing ring **126** of the first thimble **12** is enabled to constantly seal the bottom seat hole **113** so as to form an airtight status; at this moment, the liquid gas inside the gas container **2** is able to enter the top cover **19** through a gap formed between the discharge pipe **143** and the cover hole **191**, and filtered by the second filtering material **18** and passed the guide slots **142** of the inner sleeve **14** for allowing the liquid gas to be filled in the top seat hole **112**, but the liquid gas is stopped by the sealing ring **126** thereby not being able to pass the bottom seat hole **113** for being discharged out from the gas filling nozzle **1**. In addition, the neck hole **125** is shielded by the sealing ring **126**, so the liquid gas inside the gas container **2** is unable to pass the first thimble **12** and the connection pipe **16** for being discharged out from the gas filling nozzle **1**.

Referring to FIG. **4**, if a gas filling operation is desired to be processed, the gas container **2** is reversely placed, and a discharge nozzle **4** of a conventional canned gas is connected to the connection pipe **16** of the gas filling nozzle **1** for forming an inserted status, and the third anti-leaking ring **161** is able to be adjacent to an end of an opening **41** formed on the discharge nozzle **4** thereby forming an airtight effect, and the connection pipe **16** is abutted against the valve seat **11**, thereby allowing the connection pipe **16** and the first thimble **12** to be downwardly moved along the inner sleeve **14** so as to compress the first spring **15**, and the sealing ring **126** is downwardly moved with the first thimble **12** and abutted against the inner sleeve **14**, so the bottom seat hole **113** is opened, and the neck hole **125** is exposed because the downward movement of the connection pipe **16** and the first thimble **12** is greater than the downward movement of the sealing ring **126**; at this moment, the gas inside the gas container **2** is enabled to enter the top cover **19** through the gap formed between the discharge pipe **143** and the cover hole **191** and pass the second filtering material **18** and the guide slots **142** of the inner sleeve **14**, so the gas filled in the top seat hole **112** is able to be discharged to the exterior because the sealing ring **126** allows the bottom seat hole **113** to be opened. The liquid gas inside the canned gas is only

allowed to enter from the connection pipe **16** and filtered by the first filtering material **17**, and the filtered liquid gas passes the bottom thimble hole **123** and the neck hole **125** of the first thimble **12** and enters the sleeve hole **141** of the inner sleeve **14** thereby being able to be filled in through the discharge pipe **143** and the extension pipe **144** and stored in the gas container **2**.

When the liquid gas stored in the reversely-placed gas container **2** is in contact with the position limiting pipe **193**, the excessive liquid gas is able to enter the top cover **19** through the above-mentioned gas discharging path, i.e. the gap formed between the discharge pipe **143** and the cover hole **191**, and pass the second filtering material **18**, the guide slots **142** of the inner sleeve **14** and the top seat hole **112** so as to be discharged from the bottom seat hole **113**, the above-mentioned gas discharging status indicates a saturated status being formed, so the gas filling operation is able to be immediately stopped.

As a matter of fact, the longer the extension pipe **144**, the shorter the position limiting pipe **193**, and more liquid gas can be filled in the gas container **2**; the shorter the extension pipe **144**, the longer the position limiting pipe **193**, and less liquid gas can be filled in the gas container **2**.

Referring to FIG. **5**, when the gas container **2** is subject to a high temperature environment, e.g. being placed in a vehicle exposed under sunlight, when the temperature inside the vehicle is getting higher, the vaporization of the liquid gas is facilitated, so the pressure inside the gas container **2** is rapidly increased; when the pressure inside the gas container **2** is greater than the preset elastic force (pressure) of the second spring **132**, the second thimble **133** and the second anti-leaking ring **133***a* thereof are pressed for being downwardly moved, and the penetrated hole **131***a* of the end cover **131** is synchronously opened and the second spring **132** is compressed, so the high-pressure gaseous/liquid mixture inside the gas container **2** is enabled to pass the discharge pipe **143**, the sleeve hole **141**, the penetrated hole **131***a* of the end cover **131**, the thimble hole **121** and the first filtering material **17** so as to be discharged to the exterior through the connection pipe **16**, thereby preventing the occurrence of explosion.

Based on what has been disclosed above, advantages achieved by the present invention are: the first thimble of the gas filling nozzle is further installed with the safety valve, so when the gas container installed with the gas filling nozzle is subject to a high temperature environment, e.g. being placed in a vehicle exposed under sunlight, when the pressure inside the gas container is greater than the preset pressure of the safety valve, the safety valve is able to be immediately opened for discharging the high-pressure gaseous/liquid mixture inside the gas container to the exterior, thereby preventing the occurrence of explosion. Accordingly, gas filling nozzle with safety function provided by the present invention is novel and more practical in use comparing to prior art.

Many modifications and other embodiments of the inventions set forth herein will come to mind to one skilled in the art to which these inventions pertain having the benefit of the teachings presented in the foregoing descriptions and the associated drawings. Therefore, it is to be understood that the inventions are not to be limited to the specific examples of the embodiments disclosed and that modifications and other embodiments are intended to be included within the scope of the appended claims. Although specific terms are employed herein, they are used in a generic and descriptive sense only and not for purposes of limitation.

What is claimed is:

1. A gas filling nozzle with safety function, including:

a valve seat, the interior thereof being axially formed with a stepped seat hole composed of a top seat hole and a bottom seat hole, and the exterior thereof being formed with a combination part;

a first thimble, disposed in said seat hole, and the lower portion thereof being protruded out from said bottom seat hole, the interior of said first thimble being axially formed with a stepped thimble hole composed of a top thimble hole and a bottom thimble hole, a neck part defined at the outer periphery being radially formed with a neck hole communicated with said bottom thimble hole, and when said neck hole not being in a gas filling status, said neck hole being shielded by a sealing ring which being sleeved with said neck part;

a safety valve, allowing a second spring and a second thimble to be disposed in said top thimble hole, and an end cover having the top being axially formed with a penetrate hole being combined with said top thimble hole, thereby allowing the second thimble to axially and elastically retract in said top thimble hole for sealing or opening said penetrated hole; and

an inner sleeve, combined in said top seat hole, and a first spring being disposed between said end cover and a sleeve hole axially formed on said inner sleeve, thereby allowing said first thimble and said safety valve disposed at the top thereof to axially and elastically retract in said sleeve hole for enabling said sealing ring to seal or open said bottom seat hole, and the outer periphery of said inner sleeve being axially and annularly formed with a plurality of guide slots communicated with said top seat hole.

2. The gas filling nozzle with safety function as claimed in claim **1**, wherein said combination part of said valve seat is formed as a thread part, and the outer periphery thereof is sleeved with a first anti-leaking ring.

3. The gas filling nozzle with safety function as claimed in claim **1**, wherein the outer periphery of said second thimble is sleeved with a second anti-leaking ring.

4. The gas filling nozzle with safety function as claimed in claim **1**, further including a connection pipe, the outer periphery thereof is sleeved with a third anti-leaking ring, and the interior thereof is provided with a first filtering material adjacent to the bottom of said first thimble and used for filtering impurities.

5. The gas filling nozzle with safety function as claimed in claim **1**, wherein the top surface of said inner sleeve is axially extended with a discharge pipe communicated with said sleeve hole; said discharge pipe is disposed adjacent to a second filtering material used for filtering impurities, and a top cover is provided at the top of said valve seat for covering said second filtering material and the top of said inner sleeve, and said discharge pipe is protruded out from a cover hole formed at the top of said top cover.

6. The gas filling nozzle with safety function as claimed in claim **5**, wherein said discharge pipe is further sleeved with an extension pipe; the outer periphery of said cover hole of said top cover is axially extended with an engage ring, and said engage ring is sleeved with a position limiting pipe.

7. The gas filling nozzle with safety function as claimed in claim **4**, wherein said first and said second filtering material are a sintered member with micro pores formed through powder metallurgy or a sponge cushion.

8. The gas filling nozzle with safety function as claimed in claim **5**, wherein said first and said second filtering

material are a sintered member with micro pores formed through powder metallurgy or a sponge cushion.

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